



Date: March 23, 1984

Subject: Primary Metals R & D
Monthly Report - March 1984

From/Location: E. L. Cambridge/TRL

To/Location: J. G. Kaufman/AHR

PRIMARY ALUMINUM

Bauxite Analysis

Two samples of bauxite from Aughinish shipments were analyzed. Reactive silica and extractable alumina values are used to verify charges for shipments.

Alumina Properties

The literature search relating to impact of alumina properties on smelter operations is progressing. Columbia Falls is also contributing by documenting their experience and problems with -20 micron alumina fines.

MLI Technology Implementation

The project plan has been revised to fit our constraints on manpower and budget. This revised project plan will be presented to Columbia Falls personnel on April 5.

AD-124 Slurry Electrolysis

The initial start-up was terminated after four days because of a combination of anode problems, heater failures and high heat loss problems, all of which combined to sludge the cell. It is also probable that experimental adjustments were attempted before the cell reached initial thermal equilibrium.

Modifications were made to the heaters and ceramic lids, operating targets were reworked to provide less sensitivity and the cell was restarted on March 19. Under these new conditions, we have now had 5 days of continuous operations with no difficulty. The cell is being operated in a modified electrolyte mode at approximately 890°C rather than a slurry electrolyte. After allowing about one more week to complete stabilization, extensive experimental measurements will be initiated to characterize performance and efficiencies.

NEW PRODUCT/PROCESS OPPORTUNITIES

AD-120

PCACH Technology

a. ACH Calcination

Work was initiated to provide baseline calcination data related to the parametric effects of changes in particle size distribution, calcination time, temperature, steam and HCl on PCACH properties.

b. Gas Sparging Crystallization

The rebuilt laboratory unit will be ready for testing by month end. Supplies and materials for production of the 750 lb. lot are here, but we will delay the start of the run until after the Chicago trip to allow completion in one campaign.

Reactor Technology

a. CxCly Destruction

It has been established that the reactor off-gases render the WITCO coke too inactive to be effective in total removal of CxCly. Consequently, thermal decomposition can only be considered when located after the drop-out boxes and then only if a method can be established to rejuvenate it. Experiments have begun to test the use of hydrogen to decompose CxCly in the reactor off-gases both with and without passage over a reactive surface.

b. Fixed Bed Studies

Work has begun in a downflow fixed-bed reactor to determine the changes in bed properties as a function of chemical reaction. In PCACH preparation it was found sonic sifting produces a more uniform size fraction than ro-tap or air classification. Microscopic examination of several particle fractions revealed the particles to have the following relationship between length and diameter.

$$L = 3.25(D) + 0.19$$

c. High Pressure Fluid Bed Reactor

The HPFB has been modified and pressure tested at 45 (4 atm) and 50 (5 atm) psig. The control valves require further cleaning and reassembly along with other minor maintenance items. Since the system held pressure, heat tracing has begun. It is expected the system will be ready for chlorination by March 23.

The total float has been used up for this activity and succeeding activities will have to be conducted in less time in order to maintain schedule.

Coke Preparation

Continuous calcining runs have been made at 950°, 1050°, and 1150°C with a complete throughput analysis for an accurate materials balance. Analytical analyses have been completed and materials balance calculations are underway.

Additional 950°C calcining runs are being made with increased residence time for use in chlorination to compare with batch calcined coke.

AD-123 Process

AFC R-5 for the "High Performance Ceramic Oxide Plant" was submitted on March 14 and approved March 20. Bids on the plant building and site preparation are due in on March 30. Construction is scheduled to start April 9. Relocation of the USBM equipment stored on the site is underway.

Installation of a 54" x 42" pilot scale ball mill should be complete by March 23. Milling tests on HPA are planned to determine milling time, particle size, green and fired density relationships. Based on the results, an optimum sample will be chosen for comprehensive determination of sintered properties.

Delays by Cabot Corporation have moved the scheduled start of the kiln pipe corrosion test work to April 16. The corrosion test work in the 7' Bartlett-Snow kiln is critical to design of the decomposition kiln. Use of the 7' kiln is also critical to preparation of pilot lots of PCACH.

Preliminary planning is complete for the construction and installation plans of the AD-123 plant. This will be modified as vendor estimates of deliver times are obtained.

Plans are being formulated to prepare up to 2000 lbs. of SPA and HPA in the existing pilot plant to meet demand for test samples following announcement of ARCO Metals entry into this market.

AD-126 Magnesium

The project team concluded its investigation and made a presentation entitled "An Assessment and Development of Proprietary Technology that significantly Alters the Cost Structure of Magnesium Production" to the Advanced Metals and Materials Technology Committee on March 8. Two possible processes were identified which have the potential of producing primary magnesium at a cost less than 1.3 times the cost of aluminum production. Based on this presentation the Committee approved a 6 month, \$130,000 program to determine the technical feasibility of these proposed process routes.

Enzyme Immobilization Media

Contacts have been made with microbiologists at ARCO Bioengineering. They have experience in enzyme immobilization and have expressed willingness to meet with us to discuss an agenda we will formulate.

REPORTS

The following reports were issued during the month.

- 84-TP-1 "Influence of LiF and Bath Ratio on Properties of Hall Cell Electrolytes" by S. Young and R. O. Loutfy
- 84-TP-2 "AD-108 Progress Report No. 2 - Laboratory Testing of Prebaked Composite Anode" by E. D. Creamer and R. O. Loutfy

Also, the first edition of the "Project Planning User's Guide" was prepared by Dave Moran and Nelson King and distributed to Primary Metals R & D personnel.

R & D STAFF

Enrique R. (Hank) Pino joined the Ore Processing group as Senior Technician on March 1. Hank has over 21 years of directly related, broadly based experience in ore processing.

Michael W. (Mike) Burris joined the Ore Processing group on March 13. Mike is a 1983 graduate of the University of Arizona with a B.S. in Renewable Natural Resources. He worked with us as a temporary on the bleed stream pilot plant project.

Jimmie Barajas joined our Carbon group on March 19. He has a B.A. in Chemistry from the University of Arizona and has five years of experience as a technician, most recently with Pima County Wastewater Management.

Alec R. Linde joined our Chemical Products group on March 20. Alec holds a B.S. in Biology with a minor in Chemistry from the University of Wisconsin. He has 3 years to technician experience and for the last 15 months was employed at the University of Arizona Health Sciences Center in the Department of Pathology.

John Snodgrass moved from the Metals Production group to Development and Technical Services, effective March 12. John will be involved with project planning procedures, process evaluations and economic analyses.

Headcount

The headcount breakdown as of month end is:

Managers	3
Professionals	13
Technicians	17
Clerical	<u>1</u>
Total	34



E. L. CAMBRIDGE

cc: D.M.Blake	R.J.F.Thorpe
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